

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 2001-NE-19-AD; Amendment 39-13024; AD 2003-02-07]

RIN 2120-AA64

Airworthiness Directives; General Electric Company CF6-50 and CF6-80C2 Turbofan Engines

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This amendment adopts a new airworthiness directive (AD), that is applicable to General Electric Company CF6-50 and CF6-80C2 turbofan engines. This amendment requires replacement of certain existing CF6-50 and CF6-80C2 low pressure turbine (LPT) shrouds with new design LPT shrouds. This amendment is prompted by 37 LPT uncontained events on the CF6-50, 24 uncontained events on the CF6-80C2 engine models since 1993, and the development and certification of newly designed shrouds that will improve LPT containment capability. The actions specified by this AD are intended to prevent uncontained engine failure and possible airplane damage.

DATES: Effective March 3, 2003.

ADDRESSES: Information regarding this action may be examined, by appointment, at the Federal Aviation Administration (FAA), New England Region, Office of the Regional Counsel, 12 New England Executive Park, Burlington, MA.

FOR FURTHER INFORMATION CONTACT: Karen Curtis, Aerospace Engineer, Engine Certification Office, FAA, Engine and Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803-5299; telephone (781) 238-7192; fax (781) 238-7199.

SUPPLEMENTARY INFORMATION: A proposal to amend part 39 of the Federal Aviation Regulations (14 CFR part 39) to include an AD that is applicable to General Electric Company CF6-50 and CF6-80C2 turbofan engines was published in the Federal Register on May 17, 2001 (66 FR 27475). That action proposed to require replacement of certain existing CF6-50 and CF6-80C2 LPT shrouds with new design shrouds.

Comments

Interested persons have been afforded an opportunity to participate in the making of this amendment. Due consideration has been given to the comments received.

Request Withdrawal of Proposed Rule

Five commenters request that the proposed rule be withdrawn. The commenters believe that the new LPT shrouds will not prevent or significantly reduce the occurrence or severity of the more severe (SAE Category 2 or higher) uncontained events, and therefore, the economic impact is not justified by this limited improvement in safety. The commenters provided statistics to show that the vast majority (89%) of the uncontained LPT events were SAE Category 1 with no aircraft impact, and were, therefore, no hazard to continued safe flight. Data was also provided that showed that none of the Category 2 events had caused more than minor aircraft damage, and that corrective actions (i.e. inspection or replacement programs; some required by existing AD's) were available from the manufacturer to address the majority of the root causes that had led to the Category 2 events.

The FAA partially agrees. The FAA agrees that because the design criteria for the shrouds is based on ballistic containment calculations, it is difficult to quantify a benefit for the improved LPT shrouds for rub-through or push-through events. However, the FAA disagrees that the improved shrouds will not provide some additional benefit for those events where the LPT uncontainment was not exclusively of a ballistic nature. Although the events occurring to-date have not resulted in significant hazards to continued safe flight, the potential exists for future events to be more significant. Therefore, in addition to requiring that the root causes for the upstream failures that have led to uncontained LPT events be addressed, the FAA believes that the improved LPT shrouds must be incorporated to meet the intent of the regulations, which is for the engines to contain failures at the engine case level.

Extend or Eliminate Compliance End Date

Seven commenters request that the compliance end date be extended or eliminated. The commenters noted that all of the CF6-50 models would likely be in compliance by that date based on their estimated shop visit and LPT exposure rates, but that many CF6-80C2 engines would be forced off-wing early solely for this compliance, thereby imposing a significant financial burden that was not included in the economic analysis of the proposal.

The FAA agrees that the intended improvement in safety can be achieved by extending the compliance end date to support the normal shop visit and LPT exposure rates and, therefore, the proposed calendar end date is changed in the final rule.

Request for Exemption of Certain LPT Cases and LPT Shroud Configurations

Four commenters request that engines configured with a certain LPT case configuration and certain LPT shroud configurations be exempt from the proposed AD. The commenters note that the improved LPT case, part number (P/N) 1647M68G15, introduced by GE Aircraft Engines Service Bulletin (GEAE SB) 72-0946 in conjunction with certain LPT shrouds provides equivalent containment to the older design LPT case with the newest shrouds referenced by the proposed rule.

The FAA agrees. The manufacturer has provided data to show that CF6-80C2 engines configured with the later LPT cases and certain LPT shrouds provide equivalent containment capability. Therefore, CF6-80C2 engines configured with the combination of LPT case, P/N 1647M68G15, and LPT stage 2 shroud, P/N 1862M62G01 or 1862M62G03; and LPT stage 3 shroud, P/N 1862M63G01 or 1862M63G03; and LPT stage 4 shroud P/N 1862M64G01 or 1862M64G03 are

exempted from this rule. The final rule is revised to reflect this change, and the economic analysis of the final rule is reduced to reflect this change.

Request for Relaxed Compliance Requirements

Three commenters request that relaxed compliance requirements be provided for engines with certain configurations that reduce the probability of an upstream failure that has been known to result in the higher severity uncontained LPT events. The commenters believe that addressing the root causes of the uncontained LPT failures will be more effective than the new shrouds for improving containment and reducing the frequency and severity of the events.

The FAA partially agrees. The FAA agrees that upstream failures that lead to uncontained LPT events must be addressed and has already mandated corrective actions for many of those known failure mechanisms. However, as stated in the proposed rule, not all such possible upstream failure modes can be predicted or anticipated. Therefore, the FAA disagrees that relaxed compliance schedules for engines configured with certain root cause fixes will achieve the necessary safety improvement that will be realized by incorporation of the improved LPT shrouds. No changes will be made to this AD.

Request for Equivalent Replacement Parts

Five commenters request that any FAA-approved Parts Manufacturing Approval (PMA) or repaired configurations of the manufacturer's design be allowed as equivalent replacement parts for the GE service bulletin parts.

The FAA agrees. The final rule is revised to include all of the known FAA-approved equivalent parts for each of the engine models as acceptable configurations.

Service Bulletin Accepted as Compliance to Proposed Rule

One commenter requests that GE CF6-50 SB 72-1170, Revision 1, dated November 30, 1999, be accepted as compliance for the proposed rule. The commenter notes that this revision clarifies the engines that are affected by explicitly listing all of the earlier shroud part numbers that should be replaced with the new shroud part numbers.

The FAA partially agrees. The FAA agrees that the revised SB provides additional clarification on the affected engines. However, as noted in the FAA response to the previous comment on equivalent replacement parts, there are other parts in addition to those referenced in that SB that can be used to comply with this AD. The final rule is changed to eliminate the incorporation by reference of any version of the SB.

Analysis Request To Quantify Containment Improvement

One commenter requests that an analysis be provided to quantify the containment improvement provided by the new shrouds. The commenter believes that the new design shrouds do not improve the containment capability as intended because the minimum thickness of the shear section is not changed.

The FAA disagrees. The FAA feels that the containment capability of the shrouds can not be determined based on shear section thickness alone. No changes will be made to this AD.

Request for Engine Containment Test

One commenter requests that the OEM be required to perform an engine containment test to demonstrate the effectiveness of the new design shrouds. The commenter believes that other OEM's

have been required to perform such tests in order to substantiate improved containment. The commenter believes that the high cost of compliance with the proposed rule warrants such a test demonstration.

The FAA does not agree. The regulations for the most part address primary blade containment. Test demonstrations for secondary failure modes, due to multiple upstream failures, as in this case, are not normally required. In addition, the regulations allow the use of analysis in lieu of a test demonstration, and a test is not always required for substantiation. No changes will be made to this AD.

Request To Limit the Number of Times a Shroud Can Be Repaired

One commenter requests that the proposed rule be revised to limit the number of times a shroud can be repaired. The commenter notes, as stated in the proposal, that multiple repairs can lead to reduced backsheet thickness and result in reduced containment system capability.

The FAA partially agrees. The FAA agrees that multiple repairs can possibly result in reduced backsheet thickness. However, the FAA disagrees that the specific number of repairs that will result in this condition can be defined. Instead, the engine manufacturer has made modifications to the engine manual to require a check of the backsheet thickness in order to determine the serviceability of the shroud. Compliance with the revised manual limit will ensure that the minimum backsheet thickness required to achieve the system containment capability is maintained. No changes will be made to this AD.

Request for Revision to Notice of Proposed Rulemaking (NPRM)

One commenter requests that the proposed rule be revised to include improved stage 1 and stage 5 shrouds for the CF6-80C2. The commenter believes that a recent in-service event indicates that improved containment is necessary in stages 1 and 5 as well as stages 2, 3, and 4 that have already been proposed. The commenter recommends that an engineering analysis be performed to verify that these additional shrouds are adequate to prevent the failure mode recently demonstrated in plane 5 of the LPT.

The FAA does not agree. The most recent event referred to by this commenter exhibited an unusual variation of LPT uncontainment in which an extensive rub-through occurred in plane 5. The shrouds mandated for incorporation by this rule were redesigned primarily to address ballistic type containment events at stages where field experience and the manufacturer's analysis had shown deficiencies. In addition, the manufacturer has advised the FAA that although new part numbers for stage 1 and stage 5 LPT shrouds were introduced to the field at the same time as the stage 2 through 4 shrouds, the redesigns of those shrouds were made primarily to improve manufacturing and would have no appreciable affect on ballistic containment capability and no affect on the rub-through type of failure. Potential redesigns to address the case rub-through scenario are under consideration. Further rule making activity to address the rub-through failure scenario will be considered once redesigns are certified. No changes will be made to this AD.

Request for Additional Replacement Criteria

One commenter requests that replacement be allowed on the basis of attrition only and that minimum dimensional requirements be defined or other repairs be developed for the existing shrouds to allow these shrouds to be returned to service in lieu of the new shrouds. The commenter believes that an equivalent level of safety can be achieved with properly repaired or restored versions of the current shroud design while reducing the cost burden of the proposed rule on the operators.

The FAA partially agrees. The FAA agrees that the existing shrouds may be repaired in such a way as to restore the original or achieve the latest design capability. Such repairs that have been approved by the FAA and are known to the FAA have been included as equivalent parts for compliance with this rule. Also the engine manufacturer has updated their manuals to include minimum dimensional requirements for repairability and serviceability of their parts. The FAA disagrees that replacement by attrition will ensure the intended improvement in safety. No changes will be made to this AD.

After careful review of the available data, including the comments noted above, the FAA has determined that air safety and the public interest require the adoption of the rule with the changes described previously. The FAA has determined that these changes will neither increase the economic burden on any operator nor increase the scope of the AD.

Economic Analysis

There are approximately 5,055 GE CF6-50 and CF6-80C2 turbofan engines of the affected design in the worldwide fleet. The FAA estimates that 1,006 engines installed on airplanes of U.S. registry would be affected by this AD. Because this AD calls for the replacement of shrouds at piece part exposure, the FAA does not expect that additional labor costs will be accrued beyond that normally required to remove the existing shroud. New shrouds will cost approximately \$63,250 for the CF6-50 engines, and \$87,020 for the CF6-80C2 engines. Based on these figures, the total cost to retrofit all installed U.S. registered engines is estimated to be \$76,393,990 over an eight year period, or \$9,549,248 annually.

Regulatory Analysis

This final rule does not have federalism implications, as defined in Executive Order 13132, because it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Accordingly, the FAA has not consulted with state authorities prior to publication of this final rule.

For the reasons discussed above, I certify that this action (1) is not a "significant regulatory action" under Executive Order 12866; (2) is not a "significant rule" under the DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979); and (3) will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. A final evaluation has been prepared for this action and it is contained in the Rules Docket. A copy of it may be obtained by contacting the Rules Docket at the location provided under the caption ADDRESSES.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Safety.

Adoption of the Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration amends part 39 of the Federal Aviation Regulations (14 CFR part 39) as follows:

PART 39–AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

§ 39.13 [Amended]

2. Section 39.13 is amended by adding a new airworthiness directive to read as follows:

AIRWORTHINESS DIRECTIVE

Aircraft Certification Service
Washington, DC



U.S. Department
of Transportation
**Federal Aviation
Administration**

We post ADs on the internet at "www.faa.gov"

The following Airworthiness Directive issued by the Federal Aviation Administration in accordance with the provisions of Title 14 of the Code of Federal Regulations (14 CFR) part 39, applies to an aircraft model of which our records indicate you may be the registered owner. Airworthiness Directives affect aviation safety and are regulations which require immediate attention. You are cautioned that no person may operate an aircraft to which an Airworthiness Directive applies, except in accordance with the requirements of the Airworthiness Directive (reference 14 CFR part 39, subpart 39.3).

2003-02-07 General Electric Company: Amendment 39-13024. Docket No. 2001-NE-19-AD.

Applicability: This airworthiness directive (AD) is applicable to General Electric Company (GE) CF6-50 and CF6-80C2 turbofan engines, except CF6-80C2 engines configured with the combination of low pressure turbine (LPT) case, part number (P/N) 1647M68G15; and LPT stage 2 shroud, P/N 1862M62G01 or 1862M62G03; and LPT stage 3 shroud, P/N 1862M63G01 or 1862M63G03; and LPT stage 4 shroud, P/N 1862M64G01 or 1862M64G03. These engines are installed on, but not limited to, DC-10-15, DC-10-30, MD11, 747, 767, A300 and A310 airplanes.

Note 1: This AD applies to each engine identified in the preceding applicability provision, regardless of whether it has been modified, altered, or repaired in the area subject to the requirements of this AD. For engines that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must request approval for an alternative method of compliance in accordance with paragraph (d) of this AD. The request should include an assessment of the effect of the modification, alteration, or repair on the unsafe condition addressed by this AD; and, if the unsafe condition has not been eliminated, the request should include specific proposed actions to address it.

Compliance: Compliance with this AD is required as indicated, unless already done.
To prevent uncontained engine failure and possible airplane damage, do the following:

CF6-80C2 Engines

(a) For CF6-80C2 engines configured with the combination of low pressure turbine (LPT) case, part number (P/N) 1647M68G15; and LPT stage 2 shroud, P/N 1862M62G01 or 1862M62G03; and LPT stage 3 shroud, P/N 1862M63G01 or 1862M63G03; and LPT stage 4 shroud, P/N 1862M64G01 or 1862M64G03, no further action is required.

(b) At the next shroud piece-part exposure, but no later than July 31, 2010, remove existing stage 2, 3, and 4 LPT CF6-80C2 shrouds and replace with new design P/N's listed in the following Table 1:

TABLE 1.—CF6-80C2 ACCEPTABLE NEW SHROUD PART NUMBERS

Stage	Part No.
2	2083M12G01, PCT2083M12G01, KT2083M12G01, or H042 ¹
3	2083M13G01, PCT2083M13G01, KT2083M13G01, or H042 ¹
4	2083M14G01, PCT2083M14G01, KT2083M14G01, or H042 ¹

¹ Parts marked with H042, H036, or H037 are parts that have been repaired by an FAA-approved process specification. In addition to this process specification marking, each part must show its original (*i.e.* before repair) part number and a work order number (*i.e.* WOxxxxx).

CF6-50 Engines

(c) At the next shroud piece-part exposure, but no later than July 31, 2010, remove existing stage 1, 2, 3 and 4 LPT CF6-50 shrouds and replace with new design P/N's as listed in the following Table 2:

TABLE 2.—CF6–50 ACCEPTABLE NEW SHROUD PART NUMBERS

Stage	Part No.
1	1822M35G01, PCT1822M35G01, KT1822M35G01, or H036 ¹
2	1822M36G01, PCT1822M36G01, KT1822M36G01, or H037 ¹
3	1822M36G02, PCT1822M36G02, KT1822M36G02, or H037 ¹
4	1822M37G01, PCT1822M37G01, KT1822M37G01, or H037 ¹

¹ Parts marked with H042, H036, or H037 are parts that have been repaired by an FAA-approved process specification. In addition to this process specification marking, each part must show its original (*i.e.* before repair) part number and a work order number (*i.e.* WOxxxxx).

Alternative Methods of Compliance

(d) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, Engine Certification Office (ECO). Operators must submit their request through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, ECO.

Note 2: Information concerning the existence of approved alternative methods of compliance with this airworthiness directive, if any, may be obtained from ECO.

Special Flight Permits

(e) Special flight permits may be issued in accordance with §§ 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the aircraft to a location where the requirements of this AD can be done.

Effective Date

(f) This amendment becomes effective on March 3, 2003.

Issued in Burlington, Massachusetts, on January 17, 2003.
Francis A. Favara,
Acting Manager, Engine and Propeller Directorate, Aircraft Certification Service.
[FR Doc. 03-1675 Filed 1-24-03; 8:45 am]
BILLING CODE 4910-13-P